THE COSTA RICA EARTHQUAKE OF DECEMBER 22, 1990

MAGNITUDE 5.7 EARTHQUAKE IN COSTA RICA

Quick Report on Strong Motion Records from the December 22, 1990 Barbacoas, Costa Rica Earthquake

Prepared by the Earthquake Engineering Laboratory staff of the University of Costa Rica.

Provided by Guillermo Santana, Director, and William Vargas.

Accelerograms of particular interest were recorded at EEL stations during the December 22 earthquake in the Barbacoas, Puriscal, region south west of San Jose, Costa Rica. As of December 26, five records had been recovered; record recovery is still under way. It is estimated that 13 stations will have recorded the M5.7 earthquake.

The map shows the locations of the stations. The attached table lists distances from selected stations to the epicenter and the peak acceleration values.

Description of stations:
- Alajuela CIPET. This is the

Detail of column and wall failure, building A. The pipe and switch boxes were placed in a critical section.

NSF Grant #CES-8822367 funded publication and distribution of this earthquake report
Building A: masonry walls restrict column movement over most of the column height. The upper floor movement is estimated from the railing behavior.

Partial collapse of the two-story reinforced masonry building A in Corazon de Jesus, Alajuela.

Shear failure in the walls of a reinforced masonry 2-story building in Rohrmoser, San Jose.

Building A: column containing drainpipe.

closest station to the estimated epicenter, approximately 20 km distant. It has roughly 45% g horizontal acceleration. The town of Alajuela shows the heaviest damage in both low-rise buildings and houses. There are no high-rise structures in the community at the present time.

- San Ramon UCR. This station recorded 20% g horizontal; the distance to the epicenter is about
Partial roof collapse of the 2-story reinforced masonry Centro Medico Norza in El Carmen, Alajuela.

- San Jose Hatillo. This record has 20% g maximum horizontal accelerations at a distance of about 20 km; the same as the Alajuela station. The Hatillo site is located on expansive clays of about 10 meters depth.

- San Jose Geologia. This station is located in the campus of the University of Costa Rica at 30 km. There was little damage reported.
a distance of over 30 km from the epicenter. Heavy damage in older buildings was reported.

This includes structural damage in the four-story main library with the presence of short column effects on the perimeter of the first floor. Two other buildings were reported as having similar damage.

Generally, the level of horizontal accelerations recorded across the Central Valley of Costa Rica is of the order of 20% g. The present earthquake caps a year of constant shakeups starting with an M6.8 offshore event on March 25, 1990. Damage in the area from the December event, excluding the town of Alajuela, reflects poor construction quality in several structures, as well as noncompliance with the current Seismic Code. It is also evident that the Seismic Strengthening of Public Buildings and Hospitals was adequate.

The photographs of damaged buildings were taken by the researchers of the Earthquake Engineering Laboratory in the days following the December 22, 1990 earthquake.

The most extensive damage occurred in the city of Alajuela and it includes several cases of collapse of non-engineered houses and structural failure of engineered buildings. Our preliminary studies indicate a strong probability of amplification due to the soil condition in this city, particularly in the "El Carmen" sector. Recorded accelerations at Alajuela peaked at 0.45 g.

Heavy damage and collapse of houses occurred also in the towns of La Guacima, San Antonio, San Rafael, Ciudad Colón, Atenas and Puriscal, in the west end of the Central Valley. Non-engineered houses in the epicentral region (Puriscal) had been damaged by previous earthquakes (M4 1/2 to 5), occurring in May and June 1990.

Non-structural damage and minor to moderate structural damage occurred in the capital city of San José. Recorded accelerations in San José peaked at 0.15 g to 0.20 g.